



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/IB97/01278</p> <p>(22) International Filing Date: 14 October 1997 (14.10.97)</p> <p>(30) Priority Data: BO96A000514 15 October 1996 (15.10.96) IT</p> <p>(71) Applicant (for all designated States except US): ALGOTEX S.R.L. [IT/IT]; Via dei Mari, 5, I-40014 Crevalcore (IT).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only): CATTABRIGA, Matteo [IT/IT]; Via Sbaraglia Ponente, 138, I-40014 Crevalcore (IT).</p> <p>(74) Agent: AGAZZANI, Giampaolo; Interbrevetti S.r.l., Via del Cestello 13, I-40124 Bologna (IT).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>
<p>(54) Title: DEVICE FOR STABILISING THE TENSION OF THE PAPER RIBBON IN AN INK-JET VERTICAL PLOTTER FOR TRACING SHAPES FOR CLOTHS</p> <div data-bbox="527 1155 1136 1701"> </div> <p>(57) Abstract</p> <p>The device for stabilising the tension of a paper ribbon (2) is arranged in an ink-jet, vertical plotter, for tracing shapes for cloths. Said plotter is provided with a paper dragging system (1) comprising: a feeding roller (10), supporting a feeding web (3); a supporting and dragging roller (11), supporting said ribbon (2) near a printing head (4), and dragging said ribbon (2); a rewind roller (13), receiving said ribbon (2). The aforesaid device consists of oscillating tensioning means (30), which operates on the upper face (2a) of said ribbon (2), and which exerts on this latter a substantially constant force, against the dragging force exerted by the supporting and dragging roller (11).</p>		

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- 1 -

DEVICE FOR STABILISING THE TENSION OF THE PAPER RIBBON IN  
AN INK-JET VERTICAL PLOTTER FOR TRACING SHAPES FOR CLOTHS.

TECHNICAL FIELD

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The present invention relates to the technical field concerning apparatuses for printing of digitised drawings (plotters).

Particularly, the present invention relates to an  
10 improved ink-jet vertical plotter, fit to trace shapes, particularly designed to be used for cloths cutting, on a paper medium or on a similar support.

BACKGROUND ART

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It is known that the cloths cutting operation for making garments requires that suitable shapes have to be used. Said shapes are often generated by means of computers and of automatic tracing devices (plotters).  
20 These are fit to print said shapes on a support like paper or a similar medium, which is provided in form of single sheets or of a continuous ribbon supplied on a web. Generally, vertical, ink-jet plotters using a continuous ribbon of paper are preferably used, because of their  
25 small size and of their tracing speed.

Ink-jet plotters of such type carry out the shape tracing by means of a print head which slides horizontally and crosswise with respect to the paper ribbon, very close to a face thereof. Said head is operated for reciprocally  
30 crossing the ribbon along its width, printing the dots which define the shapes outline.

The ribbon is supported by a motor driven supporting

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- 2 -

and dragging roller, which is part of a complex, step driven paper dragging system, operated during the print head stops. Each feeding step width is equal to the head printing width, and it is defined by an encoder, which  
5 detects the supporting roller rotation.

The dragging system, in addition to said dragging roller, usually comprises: a feeding free roller, fit to receive a web of paper or any other suitably medium wherein shapes can be traced, placed downstream of said  
10 dragging roller, with respect to the feed direction of the ribbon; a counter-rotating roller, parallel and in contact with the same, cooperating therewith for dragging the ribbon; a motor driven ribbon rewind roller, placed downstream of the aforesaid dragging roller and print  
15 head, fit to rewind the paper ribbon after the shapes have been traced.

Italian Utility Model N. 217.771 and Patent N. 1.233.497, in the name of the same Applicant, disclose some improvements to plotters for tracing of shapes for  
20 cloths.

In fact, the above described plotters require that the ribbon tension during the dragging step is as constant as possible, in order to guarantee a correct and accurate shape tracing. Since the ribbon feeding step comes  
25 suddenly, the same ribbon is subject to fast accelerations, and its tension tends to lower, even because of the feeding web inertia. This can lead to variable ribbon feeding steps, as well as to some possible ribbon breaking.

30 The known paper dragging systems, in order to avoid the aforesaid drawbacks, are provided with a ribbon tension stabiliser, usually consisting of a "lung",

- 3 -

comprising a plurality of free rotating rollers, interposed between the feeding roller and the dragging roller, placed parallel thereof and at different heights, around which wraps the ribbon.

5       At least one of the free rollers is vertically slidable along a guide made in the plotter frame. Said roller is fit to damp the stretch exerted on the ribbon by the dragging roller during the feeding steps, and to exert in turn a stretch on the ribbon during the stop periods,  
10 thus stabilising the ribbon tension.

15       The ribbon tension stabilisers as the one above described are usually complex, expensive and not easy to use. Substituting the feeding web is normally very complex and requires a long execution time.

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#### DISCLOSURE OF THE INVENTION

It is an object of the present invention to propose a device for stabilising the paper ribbon tension, said  
20 device being mounted on an ink-jet plotter for tracing shapes for cloths, which allows to overcome all the above described drawbacks, and which is of simple and cheap construction.

A further object of the present invention is to  
25 propose a device for stabilising the ribbon tension, which moreover allows to simplify the feeding web substitution operations, and which is also reliable and easy to maintain.

All the aforesaid objects are achieved, according to  
30 the Claims contents, by a tension stabilising device which consists of an oscillating tensioning roller, interposed between a feeding web of a continuous ribbon, and a

- 4 -

roller for supporting and dragging said ribbon, said tensioning roller being supported by the upper face of said ribbon, being also hinged to a pair of oscillating arms, and being fit to exert on said ribbon a substantially constant force, against the dragging force exerted by said support and dragging roller.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10       The characteristic features of the invention are set out in the following, with particular reference to the accompanying drawings, in which:

- Figure 1 shows a schematic, perspective view of a paper dragging system in a plotter for tracing of shapes for 15 cloths, provided with a tension stabilising device according to the present invention;
- Figure 2 shows a schematic, cross sectional view of the dragging system of Figure 1.

#### 20 BEST MODE OF CARRYING OUT THE INVENTION

Referring now to said figures, numeral 30 indicates a stabilising device for stabilising the tension of a paper ribbon, or other similar support medium, in an ink-jet, 25 vertical plotter for tracing shapes for cloths.

Said plotter is provided with a paper dragging system 1, fit to take a paper ribbon 2 from a web 3, and to route it as far as a printing head 4, of known type. This is schematically shown in the accompanying drawings, and is 30 slidable along a suitable horizontal support 5. Head 4 is reciprocally operated, and it is fit to trace on the ribbon 2, according to known techniques, shapes 6 for

cloths cutting.

The paper dragging system 1 comprises a feeding roller 10, a motor driven support and dragging roller 11, provided with a respective counter-rotating roller 12, and 5 a rewind roller 13, all arranged upstream to downstream with respect of a feed direction W of the ribbon 2. Said rollers are horizontally placed inside the vertical plotter, according to known arrangements, which are designed for optimising the plotter size and the ribbon 2 10 path.

The feeding roller 10 can freely rotate about its axis, and it carries the web 3. The supporting and dragging roller 11 supports and drags the ribbon 2, in cooperation with the counter-rotating roller 12, along the 15 feed direction W, and routes it up to a printing position just underneath the head 4.

The supporting and dragging roller 11 is step operated, in a phase relationship with the motion of the head 4. More precisely, it is operated during the head 4 20 stops, occurring during its motion reversals.

The rewind roller 13, also motor driven and rotating in a phase relationship with the supporting and dragging roller 11, is approximately placed on the same vertical plane as this latter, underneath of it, and receives the 25 ribbon 2 downstream of the head 4.

The tension stabilising device 30 is interposed between the web 3 and the support and dragging roller 11; it consists of an oscillating tensioning means, supported by the upper face 2a of the ribbon 2. It is fit to apply a 30 substantially constant force to the ribbon 2, against the dragging force applied by the supporting and dragging roller 11. Since its weight is applied to the ribbon 2,

- 6 -

the tensioning means tends to form a bend in the portion thereof comprised between the web 3 and the supporting and dragging roller 11.

The tension stabilising device 30 comprises a tensioning roller 33, placed on the upper face 2a of the ribbon 2 and parallel with respect to the dragging roller 11. The tensioning roller 33 is coupled at its ends to respective ends 35a, 35b of a pair of swinging arms 34a, 34b. These are placed sideways and above the web 3, and they are hinged at their opposite ends 36a, 36b, which lay on the same vertical plane of the feeding roller 10. Arms 34a, 34b cooperate to keep the tensioning roller 33 parallel to the supporting and dragging roller 11, and to allow the tensioning roller 33 to move along an arc of the circle L whose radius is equal to the length of arms 34a, 34b.

The tensioning roller 33 is preferably fixed to the arms 34a, 34b, but it can be advantageously made free to rotate about its axis, in order to help sliding the ribbon 2.

When the vertical plotter is not operated, the ribbon 2 is stationary, and the tensioning roller 33 leans on the web 3, since this is its equilibrium position.

Operating the support and dragging roller 11 causes a force to be exerted on the ribbon 2, which tends to reduce the size of the bend 7. Said trend is opposed by the weight of tensioning roller 33, since this latter is pulled upwards, away from its equilibrium position. In this way the force exerted on the ribbon 2 by the tensioning roller 33 is substantially constant, since it is equal to the weight of roller 33, and it is directed downwards, thus keeping the roller 2 tension at a constant



- 7 -

value.

The advantages of the present invention mainly consist of stabilising the ribbon 2 tension by means of a simple device, made with a single tensioning roller 33, 5 and thus being extremely reliable and cheap.

A further advantage is to obtain, together with a easy operating device, a great simplification in the plotter maintenance and in the web changing operations.

Obviously, the present invention has been disclosed, 10 with reference to the accompanying drawings, for exemplifying and thus not limiting purposes, and it is clear that all changes can be made in that, according to its practical ways of carrying out and use, which are comprised in the field defined by the following Claims.

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CLAIMS

1. A device for stabilising the tension of a drawing support medium in an ink-jet, vertical plotter for tracing shapes for cloths, said plotter being provided with a paper dragging system (1) comprising: at least a feeding roller (10), free to rotate about its axis, supporting a feeding web (3) of said medium, provided in the form of a continuous ribbon (2); at least a supporting and dragging roller (11), placed downstream of said feeding roller (10), supporting said ribbon (2) near a print head (4) and to drag said ribbon (2), according to a feed direction (W), in a phase relationship with the operation of said head (4) and together with a cooperating counter-rotating roller (12); at least a rewind roller (13), placed downstream of said supporting and dragging roller (11) and fit to receive said ribbon (2); said device being characterised in that it consists of oscillating tensioning means (30), interposed between said web (3) and supporting and dragging roller (11), supported by the upper face (2a) of said ribbon (2) and fit to exert on this latter a substantially constant force, against the dragging force exerted by said support and dragging roller (11).

2. A stabilising device according to Claim 1, characterised in that said tensioning means (30) consists of at least a tensioning roller (33), supported by said ribbon (2), parallel with said supporting and dragging roller (11), and coupled at its ends to respective ends (35a,35b) of a pair of swinging arms (34a,34b), fit to keep said tensioning roller (33) parallel to said supporting and dragging roller (11) and to allow the same tensioning roller (33) to move along an arc of a circle

- 9 -

(L) having its radius equal to the length of said arms (34a,34b).

3. A stabilising device according to Claim 2, characterised in that said swinging arms (34a,34b) are  
5 arranged sideways of and above said web (3), and that they are hinged at their opposite ends (36a,36b).

4. A stabilising device according to Claim 2, characterised in that said tensioning roller (33) is fixed to said arms (34a,34b).

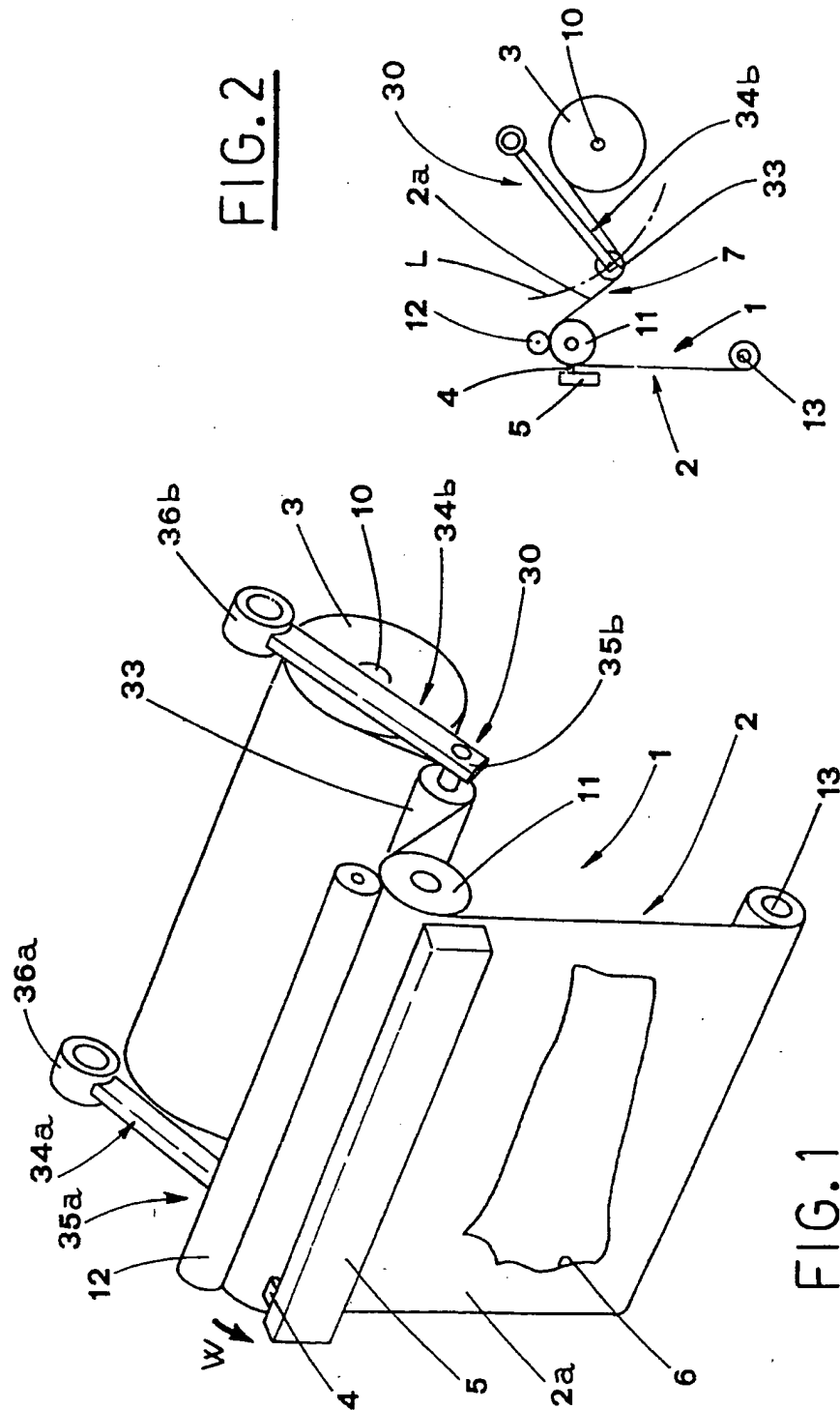
10 5. A stabilising device according to Claim 2, characterised in that said tensioning roller (33) is free to rotate about its axis.

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 97/01278

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 B41J15/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B41J

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	IT 1 233 497 A (ALGOTEX S. R. L.) 2 April 1992 cited in the application see page 5, line 9 - page 6, line 2 ---	1, 2, 5
Y	DE 800 J L; JUNG W: TECHNICAL DIGEST - WESTERN ELECTRIC., no. 47, July 1977, NEW YORK US, page 5 XP002051830	1, 2, 5
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A	ANONYMOUS: "Printer Paper Straightener" IBM TECHNICAL DISCLOSURE BULLETIN, vol. 26, no. 2, July 1983, NEW YORK, US, page 814 XP002051831 see the whole document ---	1

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☒ Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	ANONYMOUS: "Tape Tracking Guide. November 1968." IBM TECHNICAL DISCLOSURE BULLETIN, vol. 11, no. 6, November 1968, NEW YORK, US, page 649 XP002051832 -----	1,2,5
A	US 5 179 390 A (YOKOYAMA MINORU ET AL) 12 January 1993 see column 7, line 32 - line 60; figure 5B -----	1-3

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Information on patent family members

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